

PROJECT FACT SHEET

CONTRACT TITLE: Geoscience/Engineering Characterization of the Interwell Environment in Carbonate Reservoirs based on Outcrop Analogs, Permian Basin, West Texas and New Mexico

DATE REVIEWED: 07/28/1994

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OBJECTIVE: To develop effective methods of describing the three-dimensional spatial distribution of porosity, permeability, and hydrocarbon saturations in the San Andres and Grayburg carbonate reservoirs to improve recovery of remaining mobile and residual oil from existing oil fields.

ID NUMBER: DE-AC22-93BC14895

B & R CODE: AC0540/AC0530

CONTRACT PERFORMANCE PERIOD:
09/29/1993 to 09/28/1996

PROGRAM: Supporting Research
RESEARCH AREA: Geoscience

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PROJECT SITE:

Austin, TX

Carlsbad, NM

South Cowden Field, West TX

SCHEDULED MILESTONES:

FUNDING (1000'S)	DOE	OTHER	CONTRACTOR	TOTAL
PRIOR FISCAL YRS	720	187	0	907
FISCAL YR 1994	0	0	0	0
FUTURE FUNDS	0	0	0	0
TOTAL EST'D FUNDS	720	187	0	907

PROJECT DESCRIPTION: The goal of this research is to develop methods for better descriptions of the three-dimensional geometry of porosity, permeability, and hydrocarbon saturations in carbonate reservoirs, to be applied to the improved recovery of remaining mobile and residual oil from these reservoirs. Component objectives and tasks can be specified for the tasks described, a key ingredient to this study is the integrated nature of the organization, which requires common goals and parallelism of activities.

PRESENT STATUS: Work is proceeding on schedule for both facets of the study, which include description and mapping of reservoir equivalent Grayburg outcrops in the Guadalupe Mountains of West Texas and New Mexico, and geological and petrophysical characterization of the South Cowden Grayburg reservoir.

Much of the work to date on the Grayburg outcrop characterization has focused on Plowman Ridge, which provides excellent dip-oriented exposure of a 4 mile wide portion of the outer platform. Sixteen stratigraphic sections have been measured and described in detail. The measured sections have been physically correlated by walking out key marker beds and by utilizing photographs of the laterally continuous strata. Cyclic and stratigraphic hierarchies have been identified. The entire interval has been vertically sampled by more than 140 core plugs. The porosity and permeability data indicate that reservoir-quality grainstones/packstones and sandstones (porosity = 10-20%, permeability = 10's to >1000 md) are interbedded with relatively impermeable (<0.01 md) mud-dominated lithologies. Thin sections are being examined to evaluate rock fabrics and textures.

Initial work has begun on strike-equivalent Grayburg strata on adjacent fault blocks. Three measured sections have been described from West Dog canyon, 2,000-4,000 ft. west of Plowman Ridge. Stratigraphic hierarchies documented on Plowman Ridge have proven useful to establish correlations along strike. Future work over the summer and fall will focus on assessing both strike and dip lithologic variation in the Grayburg Formation throughout the region.

Work in the South Cowden reservoir to date has focused on core and wireline log study. We have completed initial description of the 28 cores and identified facies and major cycle hierarchies. Thin sections have been taken and prepared for further study of rock fabrics and textures. Stratigraphic markers have been correlated across the field using about 400 wireline logs. Structure maps have been generated at important geologic horizons and thickness maps produced for all intervals. Preliminary calibration of wireline porosity logs to core porosity data has begun. A 3-D seismic survey across part of the field has been obtained from the field operator and loaded on a VAX workstation. Synthetic seismograms have been generated across the area and used to tie wireline log horizons. Preliminary time slice mapping begun using AIS-3D software.

ACCOMPLISHMENTS:

BACKGROUND: Previous geologic and engineering studies indicate that reservoir heterogeneity is a principal cause of low recovery of oil from these carbonate-shelf reservoirs. Cost-effective methods and techniques needed to describe reservoir heterogeneity in order to characterize fluid flow and oil saturation remain elusive. Before recovery programs can be improved, descriptions of reservoir heterogeneity need to be significantly improved.